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WHAT MINING MEANS TO THE UNITED STATES[1]

Mining is the extraction of any mineral matter from the earth for the benefit of mankind. The term "earth" includes the atmosphere surrounding the earth, the surface of the earth, the formations underlying the surface (lithosphere) and the oceans (hydrosphere).

Mineral matter may be solid (coal or ore), liquid (petroleum or mineral-bearing brines), or gas (natural gas or helium). United States Bureau of Mines lists 91 solids, liquids and gases in its studies of essential mineral materials extracted from the earth for present and future generations.

Even in the cave-man era, the earth provided the stones for weapons and sustained the bison and other animals for food. But since that time two, and only two, basic industries have enabled man to progress through the Stone Age, Bronze Age, Iron Age, Industrial Age, and now the Age of Technology: (1) Agriculture, which includes farming, livestock raising, forestry and fishing; and (2) Mining, which includes winning of oil and gas, the winning of metals, nonmetallics and building materials from the earth, and the extraction of magnesium and other materials from sea water. These two basic industries supply the food, fiber, fuel and materials to feed, clothe and house us, and sustain nearly all productive industries. Without them we would have to return to the nomadic life of primitive men—the way of the Eskimo.

Most people know very little about the mining industry. Why?

(1) Because mining employs only about 0.9% of the U.S. working force.

(2) Because it occupies very little space—less than 0.3% of the surface area of the United States.

(3) Because most mines are in remote areas.

(4) Because even though mining produces more than 4-billion tons of ores, fuels, sand, gravel and stone and other essential minerals each year, the value of all metals, nonmetals and fuels recovered is only 3% of the total value of all goods and services produced in the United States (Gross National Product) annually.

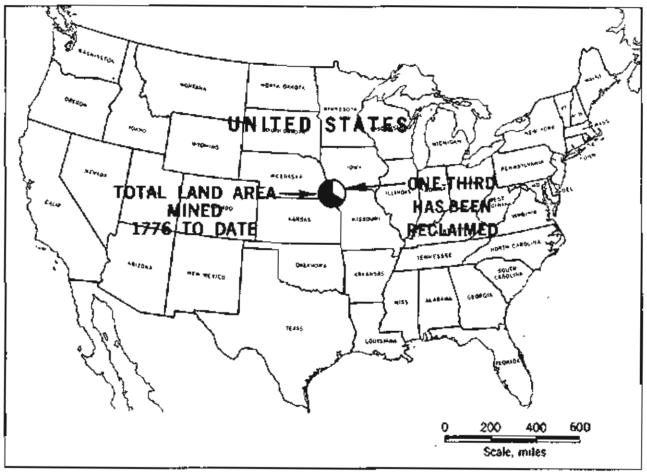
(5) Because few mined products are purchased by the public in a form that can be identified with mining.

Mining is not a giant industry, but it is one of the most essential. No nation can enjoy prosperity without a reliable source of minerals which in turn support many other industries. Many one-crop nations which depend heavily on agricultural products such as sugar, coffee, bananas, sheep and wheat have turned to mineral development and industrialization to raise their standard of living.

The United States is the most highly industrialized nation in the world and enjoys the highest, living standards because of its minerals base. With only 5% of the world's population, and 7% of the world's land area, we use about 30% of the world's mineral production. Our mineral require-

[1]Reprinted from portions of a booklet, *What Mining Means to the United States*, published and distributed by the American Mining Congress, March, 1972.

". . . One nation under God"



". . . Prudent management of the bounties of our Creator."

The mining industry has disturbed less than 0.3% of the land area of the United States including Alaska and Hawaii to produce all the mineral materials since 1776 including coal, oil, gas, stone, sand, gravel, cement rock, and metal and nonmetallic ores. One-third of the disturbed area has been reclaimed by man or healed by nature.

WHAT MINING MEANS TO EACH OF US

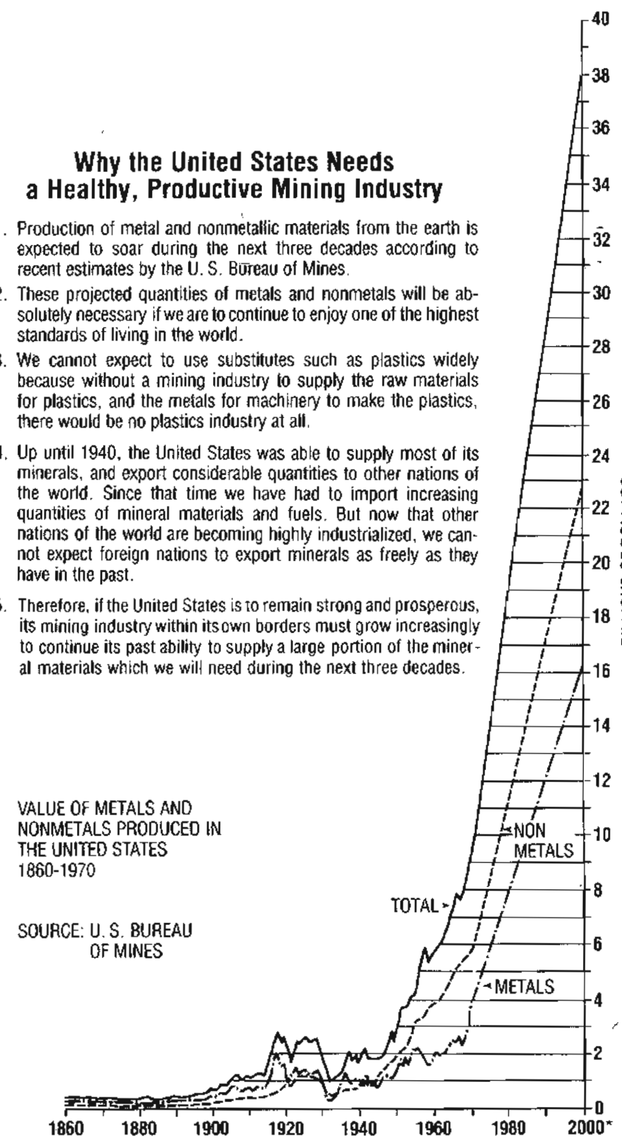
As we go through a normal day we find ourselves surrounded with constant reminders that all necessities and conveniences come from the earth directly or indirectly. The food we eat, the kitchen in which it is cooked, the dishes and cutlery on the table, the clothes we wear, the homes we live in, our car and the roads and streets on which we travel, our working place, our TV and radio, our can of beverage and most jobs would not be available without the products the earth has yielded.

The importance of mining as a basic source for all wages and salaries was explained recently by

ments are so large that we must import varying amounts of many minerals products each year except coal, molybdenum, borax, phosphate, sulfur and feldspar. The value of imported minerals is about one-tenth of the total value of all primary minerals we use each year.

But our national position of strength and industrial leadership is being challenged, and we can no longer take it for granted that foreign mineral products will flow to our nation as freely as they have in the past. At the end of World War II 25 years ago our nation was the pre-eminent military and industrial power in the world. Today there are four areas of the world that are as big or are rapidly approaching our size industrially: USSR, Japan, Western Europe and China. Steel is considered a main indicator of industrialization, and USSR, for instance, produced more steel than we did in 1971 for the first time, and Japan may produce more steel than we do within the next five years.

Added competition of world mineral supplies plus the fact that large American-developed mining properties have been expropriated in Latin America means that the United States must build up a stronger domestic mining industry at home. This can be done only if the people outside the mining industry understand how vital minerals are to their existence.



*Projected Value of U. S. Mineral Production in the year 2000

Ellery Sedgwick, Jr., chairman of the board of Medusa Portland Cement Co. as follows:[2]

> "Life has become so complex that few people realize where the money for their paycheck comes from. If it were not for the mining industry first, and the manufacturing industry second, there would be no money to pay anyone's salary. Take the example of the school teacher: he gets paid by the local school district which, in turn, collects the taxes from the residents of the community. The lawyer pays taxes, the dentist pays taxes, and the steelworker pays taxes. But who pays the lawyers and the dentists? The source of the pay they receive comes directly or indirectly from the earnings of the people who make the things that everyone wants—from people who work in the mines and factories. There is no other source of money than the wealth provided from the earth."

Even though the value of all raw fuels, metals and nonmetals produced from the earth is only about 3% of the total value of goods and services of the United States (Gross National Product), these products have a direct impact on 40% of the economy, and an indirect impact on an additional 35% of the economy. With products from the earth, American industry has built plants, equipped them with machinery, and obtained the raw materials to run the plants—in short, made jobs directly or indirectly for a large percentage of the 70 million non-farm workers of the nation.

The average amount invested per worker by 22 of the country's largest industries is about \$24,000. The mining industry has invested nearly \$71,000 per worker to buy large trucks, shovels, hoists, rock drills, compressors, railroads, and to build mills, smelters and refineries. This large investment per worker has taken much of the hard work out of mining because the machine, and not the man, does most of the job. Modern plants and high tonnage equipment have made it possible to supply the nation with low cost metals and minerals.

With the aid of 100-ton to 200-ton trucks, 6 to 12-yd. shovels, and mills that pulverize as much as 70-100 thousand tons of ore per day to concentrate and produce copper from ores containing only 5 to 12 pounds of copper per ton, our factories buy copper for about 50¢ per pound instead of \$1.00 or more per pound. Some of the larger mines in Arizona and Utah move one million tons of ore and waste every 4 to 5 days, year in and year out.

[2]Mining Congress Journal, November, 1971.

METALS ARE VITAL TO NATIONAL SECURITY

Without national security and military striking power to prevent attack, all the contributions of the minerals industry to other industries and a better way of life in the U.S. could be wiped out. Wars to preserve the freedom of many nations of the world have been won with fuels, and metals (called the "sinews of war"), as much as with determined and stout-hearted fighters and civilians.

Experience in World War I, World War II, and the Korean action, showed that stockpiles of strategic and critical metals, minerals and other materials are so essential that defense efforts can be hampered, delayed or even fail, without them.

Stockpiles of the U.S. Government as of June 30, 1971, included 55 metals, ores and mineral products valued at about \$6.8-billion. Materials valued at \$4.15-billion are essential to national security. Part of the balance is being disposed of, and the remainder may be subject to sale or use by other government agencies.

During peacetime, stockpiles of metals and minerals prevent interruptions of supply by adverse political or labor trends abroad. In event of war, especially one begun by a massive attack on our country, the stockpiles would provide vital materials during initial recovery and the time required by the industry to gear up to wartime levels of production. Above all, productive capacity of the U.S. mining industry must be preserved so that it can continue to maintain our economy and provide acceleration in an emergency.

Those who lived through World War II will recall the drive for used metals during which citizens contributed any metal products they could spare. Street car tracks were torn up for steel, and obsolete lead-sheathed power cables were dug out of pavements to meet the critical needs for metals.

In the early forties, during World War II the United States realized that the development of nuclear weapons could decide who won the war and embarked on a highly secret search for uranium in many parts of the world including Africa, Canada and other areas where uranium had been discovered. Prior to formation of the Atomic Energy Commission on January 1, 1947, about 85% of the uranium acquired for atomic weapons came from foreign sources. Then the AEC started a program to encourage a search for uranium in the United States to guarantee a large enough supply for national security, and later for the big nuclear power program which is now under way. Prospectors and exploration engineers by the thousands responded to this critical need, and participated in the largest mining boom in the history of the United States, far surpassing the gold rushes in California and the Klondike. The result was discovery of enough uranium not only to take care of all military needs, and initial needs for nuclear power plants, but also to allow some for export to other nations. Over the past 20 years nearly 200,000 tons of uranium oxide (yellow cake) have been produced by American mining companies.

HOW MUCH DO WE USE—HOW MUCH DO WE NEED

Minerals are like money in the bank—without them a nation will quickly decay and its people will face a lower standard of living. That is why the United States is taking an inventory of mineral resources through the U.S. Bureau of Mines and the U.S. Geological Survey. But the job of estimating mineral reserves is a difficult one. The mining industry does a good job of estimating known reserves. But logic tells us that a large portion of the minerals of the future are yet to be discovered. Nature has hidden them effectively. Geologists admit, for example, that our knowledge of mineral deposits at depths of 4,000 to 6,000 feet in the U.S. is based only on intelligent guesswork. Mining companies must spend millions of dollars each year to find the minerals and fuels we'll need in the future. Mining companies must find at least one pound of new metal for every pound they mine simply to stay in business. Each year our geologists and exploration engineers will have to find about 100-million tons of iron ore, 175-million tons of copper ore, 20-million tons of lead and zinc ore, 10-million tons of molybdenum ore, and 40-million tons of phosphate rock just to keep the U.S. supplied with its present consumption of these metals and minerals.

Finding new minerals is a costly undertaking. In Southeast Missouri, mining companies spent $75 million over a 22-year period to find about one billion tons of lead ore and one billion tons of iron ore. Since the Missouri lead deposits are buried under several hundred feet of overlying rock, and the iron ore deposits lie several hundred to several thousand feet below the surface, exploration engineers had to search for new ore by boring to great depths with hollow drills that yield cores of waste rock or ore for examination by geologists. One company drilled 40,000 feet at a cost of over $200,000 before it intersected the first pound of lead ore. Others have spent huge sums in the search and didn't find a thing.

In testimony before the Senate Interior Committee on September 22, 1971, Ian MacGregor, Chairman of the Board, American Metal Climax, Inc., cited statistics showing that costs of finding new ores have gone up. During the period 1955-1959 it cost $1 to find $87 worth of metallic ore in Western United States; in the period 1965-1969, it cost $1 to find $46 worth of metallic ore. Stating that it is exceedingly difficult to find a good ore deposit, he said,[3]

> "As an example of how great the odds are against finding a viable mineral deposit, consider that from 1939 to 1949, the U.S. Government Strategic Minerals Development Program examined 10,071 prospects and only 1,342 of these deposits were ever worked. Of the 1,342 deposits worked, only 1,053 developed ore-grade tonnage but not necessarily

[3]Mining Congress Journal, October, 1971.

Value of Mineral Production in the United States, 1940-70

(Billions of Dollars)

Year	Metals	Nonmetals	Subtotal	Fuels	Total[1]
1940	.8	.8	1.6	2.7	4.2
1941	.9	1.0	1.9	3.2	5.1
1942	1.0	1.1	2.1	3.6	5.6
1943	1.0	.9	1.9	4.0	5.9
1944	.9	.8	1.7	4.6	6.3
1945	.8	.9	1.7	4.6	6.2
1946	.7	1.2	1.9	5.1	7.1
1947	1.1	1.3	2.4	7.2	9.6
1948	1.2	1.6	2.8	9.5	12.3
1949	1.1	1.6	2.7	7.9	10.6
1950	1.4	1.8	3.2	8.7	11.9
1951	1.7	2.1	3.8	9.8	13.5
1952	1.6	2.2	3.8	9.6	13.4
1953	1.8	2.3	4.1	10.3	14.4
1954	1.5	2.7	4.2	9.9	14.2
1955	2.1	3.1	5.2	10.8	15.9
1956	2.4	3.4	5.8	11.7	17.5
1957	2.1	3.4	5.5	12.7	18.2
1958	1.6	3.5	5.1	11.6	16.6
1959	1.6	3.9	5.5	11.9	17.4
1960	2.0	3.9	5.9	12.1	18.0
1961	1.9	3.9	5.8	12.4	18.2
1962	1.9	4.1	6.0	12.8	18.8
1963	2.0	4.3	6.3	13.3	19.6
1964	2.3	4.6	6.9	13.6	20.5
1965	2.5	4.9	7.4	14.0	21.5
1966	2.7	5.2	7.9	15.1	23.0
1967	2.3	5.2	7.5	16.2	23.7
1968	2.7	5.4	8.1	16.8	24.9
1969	3.3	5.6	8.9	18.0	26.9
1970	3.9	5.7	9.6	20.2	29.8

Projected Value of U.S. Mineral Production in the Year 2000

(Based on estimated price increases)

Year	Metals	Nonmetals	Subtotal	Fuels	Total
2000	16.0	22.4	38.4	68.9	107.3

Source: U.S. Bureau of Mines. [1] Data may not add to totals shown because of independent rounding.

successful mines. The only substantial success from this entire government program is the San Manuel mine of Newmont Mining Corp. These statistics suggest that the odds are over 10,000 to 1 against finding a good ore body."

TOWARD A BETTER UNDERSTANDING OF MINING

Andrew Fletcher, Honorary Chairman, St. Joe Minerals Corp. said that "few people are able to relate mining to their everyday living," in the following excerpts from a speech on "The Image of Our Mining Industry":[4]

"We see evidence today that the general public's view of mining and the views of many people in a position to influence the industry's future are badly out of date and based on real misconceptions. Our 'image' today is that of the bearded miner with pan and burro, and, while this is an 'image', it's certainly not one which we want or one which will attract the capital, the people and the support our industry needs. And more to the point, it's totally inaccurate.

"Mining companies today are intimately involved with the most complex of electronic equipment, and the burro has long since been replaced with helicopters. Far from being the stodgy, unrealistically conservative industry which the bearded miner implies, we are deeply interested in the new developments around us—undersea mining, for example—and it doesn't take much imagination for *us* to see that among the first to set foot on the moon should be a geologist and a mining engineer. This kind of image, though, is far from the one we are communicating.

"Last year the Lead Industries Association employed a firm to make a survey of the public's knowledge about lead with the thought of using the results as a basis to formulate an informational program. The results were unbelievable. Nearly a quarter of the survey respondents said 'don't know' when asked to name a single use for lead. Well over a million tons of this metal were consumed last year in the United States, but about 25 percent of the people asked couldn't name one single use. Seventeen percent said 'pencils', but of course no lead is used in pencils. Only six percent knew that every time they started their car they were strongly relying on the lead metal in their battery.

"I don't want to belabor this one survey, but it was startling to us in the lead-zinc field, and it is pertinent to speculate as to what answers the public might give if asked about mining. It is not hard to visualize what the results would be. Few people would be able to relate mining to their everyday living; fewer still would be able to assess mining's contribution to our economy. And if asked to describe a mining operation, the vast majority of people would in all probability accurately describe a gold mine of the Old West, based on their exposure to a multitude of late shows and little else, or a coal mine in which a canary is the miner's constant companion. This may be a bit harsh, but it is close to the fact—most people view mining as a destructive, exploitive industry with an antique pallor. We are proud of our role, of our methods, of our success, and of our progress, but we have just not gotten a message on these across."

In case you are one of those who doesn't realize when you start your car, it's lead that supplies the power to turn the engine, we have listed the following common metals and minerals and some of the ways in which they serve you in your everyday life:

Metal or Mineral	**Common Uses**
IRON ORE (STEEL)	Electric household appliances, automobiles, buildings, office equipment, beverage and food cans and other containers, tools, farm and factory machinery, transportation equipment of all types.
COPPER	All electric appliances, telephones, radios, TV sets, automobile radiators and electric systems, motors for all purposes, ornamental items made of brass and bronze, plumbing pipes, pennies, and roofing.
LEAD	Storage batteries, gasoline additives, red lead for coating construction steel, lead

(Continued on page 32)

[4]Mining Congress Journal, November, 1967.

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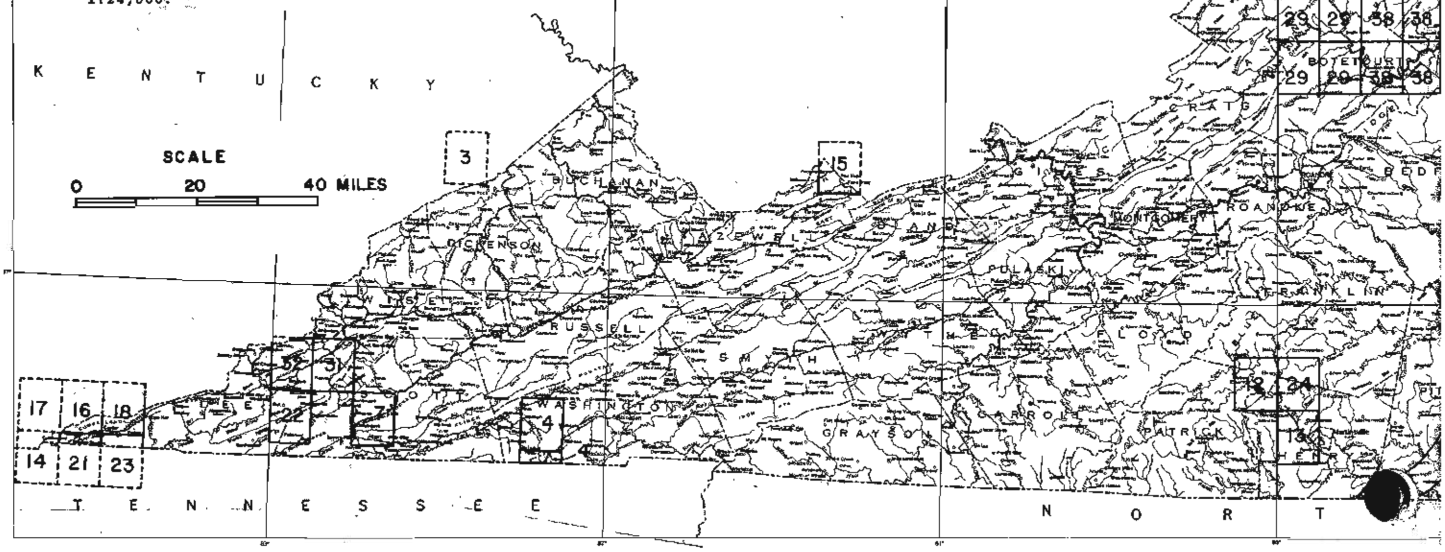

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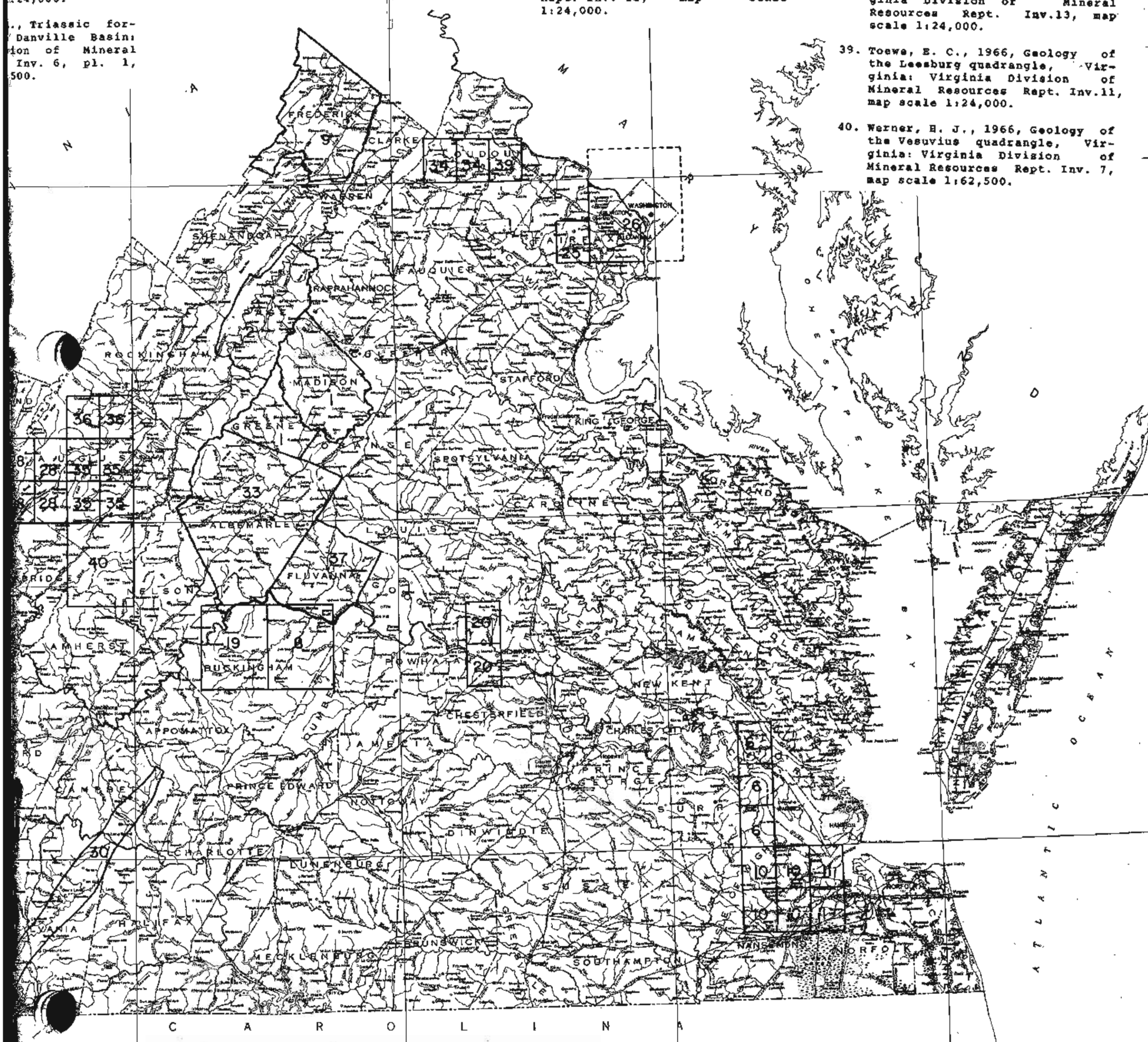

Maps with a scale larger than 1:24,000, guidebooks, and generalized maps have been excluded from this index.

foil for toothpaste tubes, solder for cans and containers, type metal for printing, radiation shielding, and sound proofing for rooms and machinery.

ZINC — Galvanized roofs, siding, fences, auto bodies; zinc die castings for carburetors, automobile grills and trim, home appliances, door handles; zinc oxide for auto tires and paints; rolled zinc in dry-cell batteries; and brass and bronze ornamental and utilitarian objects.

TIN — Tin coated cans, solder, pewter ware, in bronze and brass, in electrical equipment and supplies, in pigments for paints and plastics and in dry-cell batteries.

ALUMINUM — Beverage and food cans; lawn chairs; building roofs and siding; electric appliances; air conditioners; canoes, ships, automobiles, trucks, airplanes and other transportation equipment; cooking utensils; aluminum foil for packaging and kitchen use; high-voltage power transmission lines.

NICKEL — Automobiles, airplanes, transportation equipment, household appliances, electrical machinery, ships and boats, coinage, and numerous ornamental and utilitarian alloys.

TITANIUM AND TITANIUM OXIDE — Brilliant white pigments in paints, paper, and plastics; floor tile; printing ink; fiberglass; ceramics; and metal in jet plane turbines and structures.

MERCURY — Electrical batteries, lamps, switches, paints, plastics, medicines, dental tooth fillings, and in the manufacture of chlorine for chemical plants.

MOLYBDENUM — Automobiles, airplanes, machine tools, pipes and tubing, catalysts to make pigments and refine petroleum in automobile greases and oils, fertilizers, welding rods, in electrical and electronic equipment, and in stainless steels.

SILVER — Photographic films and print paper, silverware, jewelry, industrial refrigerators, coinage, batteries, electric switches, all electronic equipment such as radios, TVs, etc., solder in aircraft.

PLATINUM — Industrial chemicals, petroleum refining, glassware, telephones, dental equipment, and jewelry.

ASBESTOS — Construction cements, floor tile, paper products, brake linings, and clutches for all transportation equipment, textiles, paints, power lines, electric roofing and siding for buildings.

BARITE — Mud for drilling oil wells and in glass, paints, rubber, and paper.

FELDSPAR — Glassware, pottery, enamel and scouring powders.

FLUORSPAR — Refrigerants for refrigerators and air conditioning equipment, steel making, refining of aluminum, manufacturing of nuclear fuels, propellants for spray paints, cosmetics and insecticides.

GYPSUM — Plaster, plaster board, cement, binders for orthopedic and dental casts, fertilizer, and in crayons.

PHOSPHATE ROCK	Fertilizers, soap and detergents, plating and polishing, feed for animals and fowl.
POTASH	Fertilizers, soap and detergents, plating and polishing soap, glass and chemicals.
SALT (sodium chloride)	De-icing agents for roads and streets; food preparation and home cooking; a source of chlorine used to make paper, plastics, solvent fluids for automobiles; sprays to kill pests; and sanitation purposes.
SULFUR	Fertilizers, pigments for paints and plastics, rayon, explosives, manufacture of steel, petroleum refining, alcohols, pulp and paper, refining of many metals.

Some people have suggested that plastics can be substituted for metals, but the foregoing list makes it obvious that without metals and minerals from the earth, there would be no plastics industry at all.

This brief listing cannot hope to convey the scope of the contribution that metals and mineral products make to everyday life, nor their significance. At least two important dimensions are missing, first the incalculable scope for human inventiveness for which these minerals provide the raw materials, and second, the enormous changes in the character and quality of life that they have wrought under human control.

The effects of progress in transportation provide an example. Mining products have provided a substantial portion of raw materials to build some 80 million trucks, buses, and automobiles, plus millions of miles of paved roads and highways, plus some 100,000 civilian and commercial aircraft and the 11,000 airports they use, plus the electrical machinery and petroleum and electrical energy sources to make the whole thing go. The result is mobility, with which the Average American can conquer time and distances, accepting as a matter of course that he may go several miles to buy a loaf of bread, to another state to visit his relatives, and quite possibly to another continent on a business trip or a vacation. Without the power that the mineral products of the earth have given man to extend his reach, this mobility would not exist. Extend this illustration into each of the areas where metals and minerals have changed man's life and it becomes possible to begin to assess the impact produced by mining, all from an area less than a third of one percent of the nation's surface.

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ADDITIONS TO STAFF

Mr. Paul A. Daniels, Jr. joined the Division staff on August 1, 1972 and will be working for the Coastal Plain section. Mr. Daniels received a B.S. degree in geology from Western Michigan University in 1966, and a M.A. degree in geology from Bowling Green University in 1968. Two additional years of graduate study in environmental sciences were taken at the University of Virginia.

Mr. Daniels' professional experience includes mineral exploration and petroleum development with Cominco Limited and Humble Oil and Refining Company. Areas of field experience include the Midcontinent, Mid-Atlantic coast, Eastern Canada, northern Rocky Mountains, West Texas, and Texas Gulf Coast regions.

Mr. Thomas H. Biggs was employed by the Division on August 16, 1972 as a member of the map transfer program. He will assist in the transfer of published and unpublished geology to 7.5-minute topographic quadrangles, the topographic-mapping program, and the preparation of a geographic index for Virginia. He graduated in 1972 from Virginia Polytechnic Institute and State University with a B.S. degree in geology and a B.A. degree in history.

Mr. Paul G. Scheible joined the Division staff on August 16, 1972 and will assist in geologic mapping and petrographic studies in the Piedmont province. He received a B.S. degree in geology in 1968 from the University of Rochester and a M.A. degree in geology from Johns Hopkins University in 1971. Mr. Scheible is married.

Mr. James L. Poole joined the Division staff on October 1, 1972 and will assist in various phases of economic geology. He received his B.S. degree in geology from the Wayne State University in 1969 and a M.S. degree in geology from the University of Tennessee in 1972. He was previously employed with the Kerr-McGee Corporation in uranium and metal exploration in the eastern United States.

NEWS NOTES

Atlantic Materials, Inc. began production of construction sand and gravel at a site near Sealston, King George County, in July.

The Sugar Grove Sand and Stone Company has begun production of construction sand at a site northwest of Sugar Grove, Smyth County.

COMPLETE TOPOGRAPHIC MAP COVERAGE OF VIRGINIA

For the first time, Virginia's 40,595 square miles are completely covered by 7.5-minute series topographic mapping at a scale of 1:24,000 (1 inch equals 2,000 feet). This is the culmination of a ten-year program under a $9 million cooperative effort shared equally by the Commonwealth of Virginia and the U.S. Geological Survey. Virginia is now the tenth State to be completely covered by this scale. These maps portray by colors, symbols, and words the surface of the State. Over 800 uses of these maps for industrial developers, planners, sportsmen, and the citizen have been demonstrated. A concurrent program to keep them up-to-date has been in operation since 1968. Aerial photographs, from which the maps are prepared, are an important by-product.

This outstanding achievement is the result of an accelerated mapping program initiated in 1962 by Dr. James L. Calver, State Geologist, Division of Mineral Resources. It had the full support of the Governor, General Assembly, and Department of Conservation and Economic Development.

Topographic mapping of the Commonwealth began in 1883. The quality of the early reconnaissance-type maps was often dependent upon the map-maker's skill in artistic sketching and woodmanship. By the late 1930s, with the demand for more detail and accuracy, the present type of mapping, prepared from inspection of aerial photographs and on-site investigations, was begun.

A topographic map is a portrayal to scale of the State's surface features, both natural and man-made. Standard symbols and colors are used to depict features. Brown is used for relief; blue for water features; black for works of man and cultural names; red for major roads, urban areas, and prominent fence lines; and green for vegetation. Symbols portray road types, bridges, power and pipe lines, dams, building use, quarries, political boundaries, etc.

These maps can be used for planning, selection and development of sites for industrial plants, highways, and airports; for location of radio and TV towers; and for selection of subdivision areas. On the farm, maps can be used as an aid to determine where to plant crops or to cut timber, or how to plan drainage systems for the collection or dispersal of water. During times of natural disaster, such as the floods of Hurricane Camille 1969 or tropical disturbance Agnes 1972, maps are examined to determine access routes to aid victims. Vacationers, prospectors, fishermen, hunters, mountain climbers, etc., use these maps to obtain a "birds-eye" view of the country around them.

To keep these maps up-to-date each portion of the State will be examined for revision need each five years by inspection of aerial photographs. Maps in growth areas will be revised. Growth patterns can then be determined as this new information will be printed in magenta. Thus, the dimension of time will be shown which will be usable to planning, zoning, and construction officials and others involved in urban development. Photorevised maps for most of the independent cities of the Commonwealth are available. Currently, the area roughly bounded by Waynesboro, Fredericksburg, Washington, and Winchester is being inspected from spring 1972 photos.

As a by-product, aerial photography of about the same scale as the 7.5-minute topographic maps is available for most of the Commonwealth. In addition, beginning this spring, high altitude quad-centered photography, scale about 1:72,000, is now available for parts of northern and central Virginia. One 9 inch x 9 inch print of this depicts the area of a 1:24,000-scale map; three-time enlargements of these prints are about the same scale as the map. Information on availability and cost of aerial photography can be obtained from the Map Information Office, U.S. Geological Survey, Washington, DC 20242.

In addition to the above-mentioned, maps which show larger areas, but in less detail, are available for Virginia. Special maps include those for the Shenandoah National Park; Washington and vicinity; Blue Ridge Parkway; and national monuments, seashores, and historical parks. Virginia State maps at the 1:500,000-scale are available in the topographic, planimetric, and shaded relief-editions. The 1:250,000-scale maps, useful for regional planning, can be obtained for the entire State.

Maps of the 7.5-minute series can be purchased for $0.75 each (plus 4 percent State sales tax for Virginia residents) from the Virginia Division of Mineral Resources, Box 3667, Charlottesville, VA 22903. Index maps depicting topographic coverage and information on maps being up-dated can be obtained upon request.

THE MINERAL INDUSTRY OF VIRGINIA IN 1971[1]

ADVANCE SUMMARY

Total value of mineral output in Virginia was $385.2 million, an increase of 2.9 percent over the $374.3 million reported in 1970. This was the ninth consecutive year that mineral values have increased. Of the total mineral production value, approximately 66 percent was contributed by fuels, 2 percent by metals, and 32 percent by nonmetals.

Stone declined slightly in output but increased 5 percent in value. Sand and gravel production rose 15 percent and value rose 33 percent. Masonry cement increased substantially in both production and value, while portland cement decreased in output and output value. Total lime production decreased 28 percent in output and 22 percent in value compared with 1970.

[1]Prepared October 2, 1972 in Division of Fossil Fuels, U.S. Bureau of Mines, under a cooperative agreement between the Bureau and the Virginia Division of Mineral Resources for collecting information covering the mineral production from mines, quarries, and wells other than the production of fuels.

Table 1. — Mineral production in Virginia.[1]

Mineral	1970 Quantity	1970 Value (thousands)	1971 Quantity	1971 Value (thousands)
Clays .... thousand short tons	1,633	$ 1,672	1,710	$ 1,800
Coal (bituminous) .... do	35,016	246,181	30,628	254,870
Gem stones	NA	7	NA	12
Lead (recoverable content or ores, etc.) ...... short tons	3,356	1,048	3,386	934
Lime .... thousand short tons	1,046	14,090	759	11,049
Natural gas .... million cubic feet	2,805	864	2,619	822
Petroleum (crude) .... thousand 42-gallon barrels	1	W	1	W
Sand and gravel .... thousand short tons	11,126	15,229	12,796	20,201
Soapstone .... short tons	3,760	9	3,704	8
Stone .... thousand short tons....	35,415	60,477	34,643	63,482
Zinc[2] (recoverable content of ores, etc.) ...... short tons	18,063	5,534	16,829	5,419
Value of items that cannot be disclosed: Aplite, cement, feldspar, gypsum, kyanite, salt, titanium concentrate, and values indicated by symbol W	—	29,210	—	26,564
Total		$374,321		$385,161

NA Not available. W Withheld to avoid disclosing individual company confidential data.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Recoverable zinc valued at the yearly average price of prime western slab zinc, East St. Louis market. Value established after transportation, smelting, and manufacturing charges have been added to the value of ore at the mine.

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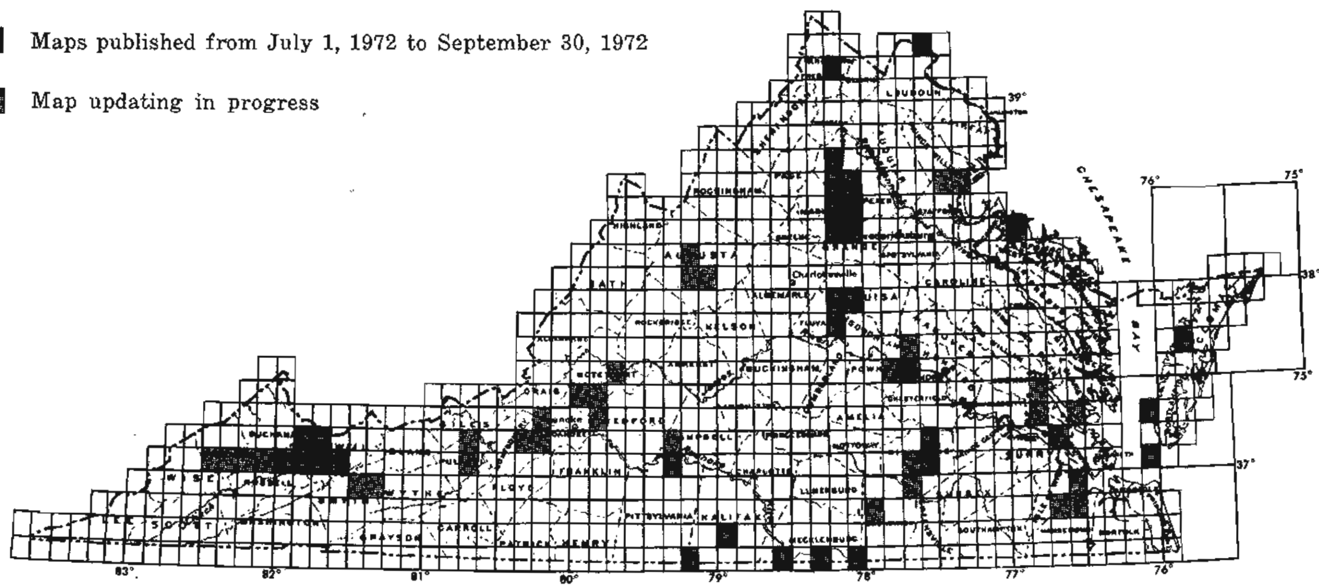
TOPOGRAPHIC MAPS

7.5-MINUTE QUADRANGLE TOPOGRAPHIC MAPS

☐ Maps published prior to July 1, 1972

■ Maps published from July 1, 1972 to September 30, 1972

▩ Map updating in progress



Maps published from July 1, 1972 through September 30, 1972:

*Altavista
Amonate
Brightwood
Cape Charles
Castleton
Chesapeake Channel
Clarksville South
Colonial Beach North
Columbia
Culpeper West
*Dinwiddie
Ferncliff
Honaker
Jewell Ridge
John H. Kerr Dam
Madison Mills
*Midlothian
Milton
Point of Rocks
Pounding Mill
Pungoteague
Rapidan
Richlands
South Boston
South Hill SE
*Sutherland
Tazewell South
Washington
*Winchester
Woodville
Zion Crossroads

*Updated

PUBLISHED MAPS

State index is available free. Updated maps, on which recent cultural changes are indicated, are now available for certain areas of industrial, residential, or commercial growth. Published maps are available at 75 cents each (plus 4 percent state sales tax for Virginia residents) from the Virginia Division of Mineral Resources, Box 3667, Charlottesville, VA 22903.